in contact. The mischief may possibly be seated in the corpora quadrigemina or geniculata, or even in the cerebellum itself.

As to the nature of the mischief in the brain, it is difficult to do more than hazard guesses. Is it a temporary suspension of function among the nerve-cells of the visual sensorium, due to vascular congestion, and relieved by the relief of that congestion? Does the headache tell of the further propagation of the nervous disturbance into parts of the brain where disturbance is ache, as in the visual tract disturbance is abnormal sensation of light? And the detriment to speech and hearing,—does it mean extension of the same disturbance still further into the regions of brain-substance appropriate to those functions? Or is the attack in any way analogous to a fit of epilepsy?

The phenomena are so definite and so localized, and their course is so regular, that we can hardly avoid the conviction that their cause is equally definite and equally localized; and it is difficult to admit so vague an agent as nervous sympathy with gastric derangement, except as acting through the medium of some secondary local manifestation in the brain.

II. "Account of the Great Melbourne Telescope from April 1868 to its commencement of operations in Australia in 1869." By Albert Le Sueur. Received January 8, 1870. Communicated by the President.

A description of the great Melbourne reflector, and its history, up to the time of inspection by the Committee, have been communicated to the Royal Society; the following additional account of the doings connected therewith since the instrument was consigned to my care may be of interest to the Society.

Mr. Grubb commenced taking down the telescope at the end of April 1868; this was accomplished in no great length of time, and without any difficulty. The specula (by the advice of Mr. Lassell, who had found this method answer perfectly) were coated over with shellac varnish to prevent oxidation on the voyage out; they were then protected in their cells and on their lever supports by strong double wood casings, and the other parts of the telescope and machinery cased or otherwise protected. The only casualty which there seemed to be any reason to fear could give rise to any serious consequences was a tilting over of the speculum cases; their great weight was, perhaps, a sufficient guarantee from such an event: it was nevertheless thought prudent that the telescope, and machinery generally, should not be left entirely to the tender mercies of the shipping and crane labourers; I was therefore present at the shipping in Dublin on board a steam-tug hired for the purpose, and at the transshipment in Liverpool, on board the 'Empress of the Seas.'

Both these operations were performed satisfactorily, and without any serious casualty.

The 'Empress of the Seas' sailed from Liverpool on the 17th or 18th of July; I followed by the August Overland Mail.

On my arrival in Melbourne I found that, beyond the selection of a site in the Observatory grounds, nothing had yet been done towards the erection of piers or building; this was principally owing to the fact that Mr. Ellery and the Board of Visitors had not considered the information which they possessed sufficiently definite to warrant their placing the matter in the hands of the Works Department; it had therefore been thought advisable to await my arrival.

Some necessary modifications having been made in the drawings, the construction of the piers was soon proceeded with, and satisfactorily terminated at the beginning of this year.

In the mean time the 'Empress of the Seas,' with her precious cargo, had arrived, after a very long voyage, which for some time was the cause of much uneasiness; parts of the instrument were unpacked and temporarily housed: the whole appeared in fair order; there was certainly no material damage done to anything.

Arrangements being in progress for the erection of a suitable building, it was thought advisable to delay mounting the telescope until part of the building was constructed; little therefore was done for some time beyond setting up, as accurately as possible, the plummer-blocks which contain the polar axis bearings.

The building was commenced early in the year, and when it was thought that sufficient progress had been made, the crane which had been used in the erection of the piers was removed to a more convenient position, and the various heavy parts of the instrument lifted on to the floor of the telescope-room, over the walls or through a gap left for that purpose, and, for convenience in after operations, in the north wall and north end of the west wall.

The mounting was then proceeded with, and satisfactorily accomplished in little more than a week, as regards the main parts, without much difficulty.

Attempts were made on one or two occasions to use the instrument for adjustment and observation, but it was found that the dust (a dreadful enemy in the summer) and the grit caused by the building accumulated to such an extent as to lead to fear of considerable damage to the bearings and more delicate parts of the machinery; it was therefore deemed prudent to cover up the telescope as well as possible with tarpaulins, and leave it in that state for some time.

The building is rectangular, 80 feet long meridionally by 25 wide, with walls 11 feet high. Of the meridional length the telescope-room occupies the north 40 feet; the next 12 feet are appropriated to the polishing-machine, crane, and engine; the remaining 28 feet are divided into two rooms, one of which is at present used as an office, the other, 25 by 14, is intended

for a laboratory. The moveable roof is 40 feet long, and runs on rails laid the whole length of the walls; the telescope-room may therefore be completely covered in, and as completely uncovered when required, the roof in the latter case resting on the south building, which on that account has a very low permanent roof.

The roof is constructed of six triangular wrought-iron principals, cross-braced, which abut at each side on a broad horizontal plate formed of two parallel lengths of stout angle-iron, connected at various points by iron bands; for additional strength, a broad vertical plate is bolted to the outer angle-iron piece. There are four pairs of wheels, 26 inches in diameter, flanched on the inside; these lie along the middle of the horizontal plate, the journals being bolted to the angle-iron pieces which form the plate.

The roof is covered with galvanized corrugated iron; it is therefore on the whole a somewhat heavy affair. The mechanical arrangements for moving are, however, simple and effective; a stout iron shaft runs across the building, and gears by wheel and pinion on the axles of the two south end wheels; to this shaft is fixed a spoked hand-wheel, by means of which the operator readily sets the roof in motion, and standing on a small platform connected therewith, is himself carried along at the same time.

The design of the roof is due to Mr. Merrett, of the Works department. On the whole, there is much to be said in favour of this rectangular form of roof: the temperature even in this climate frequently descends too low to be pleasant; but the occasional bodily inconvenience produced thereby is more than counterbalanced by perfect freedom to the observer, and the gratification of knowing that the instrument is in the best possible conditions for satisfactory performance. Only one really serious annoyance have I found connected with complete exposure; I allude to occasional heavy dew rendering it almost impracticable to use the sketching and other papers, the speculum meanwhile remaining free from deposit if precaution is taken not to work at too great an altitude.

The telescope, when housed, lies meridionally on the east side of the pier, and nearly in a horizontal direction, provision having been made to prevent the tube being lowered beyond a certain small inclination.

The piers are in keeping with the massiveness of the instrument; they are constructed of large, not to say huge blocks of basalt axed to a fine surface, altogether a substantial and beautiful piece of work.

The height of the walls with reference to the piers is such that very little of the sky range is curtailed. The north wall cuts off objects having a lesser altitude than about 10°. When resting on the east or west walls the telescope is nearly horizontal; in both these directions trees interfere, especially on the west side, where the ground rises. This curtailment will probably be a matter of very small importance, as with a four-feet

aperture observations at low altitudes are almost impracticable, and would probably never have to be resorted to except in the case of comets. The roof itself cuts off some of the range near the subpolar meridian; this, again, is not likely to be of much consequence.

The steam-engine, polishing-machine, and crane have been mounted in the room devoted to them; this room adjoins and is on the same floor (raised 4 feet from the ground, and 3 to 6 feet from the floor of the other rooms) as the telescope-room. To the east end of this machine-room, and communicating therewith, a small lean-to boiler-house has been added; in the west wall is a window which, when open, will leave sufficient clear space to admit of viewing a distant nearly horizontal object for the purpose of testing the mirrors.

The large speculum (A) was originally attached to the tube in its varnished condition; on the first favourable occasion it was taken down and unvarnished—a process which proved more troublesome than had been anticipated. The lac was very refractory, and the difficulty of removal exaggerated by the extreme heat then prevalent; after a process of solution in alcohol, mopping up, and washing with water frequently repeated, although there seemed no lac which would still dissolve, a large number of markings caused originally by the varnish brush were apparent, and the whole surface had an unpleasant mealy appearance.

It was thought, however, that the light lost would not prove serious, and in any case it did not seem that any further operation except polishing would improve matters; the speculum was therefore remounted and tried; and although it was of course impossible to say what would have been the effect of a more perfect polish, the views given of the brighter nebulæ were grand in the extreme, and left nothing to be desired.

By degrees, however, and without much exposure, the surface became more and more tarnished, with evident effect on the performance.

In the meantime the second mirror (B) had been unvarnished; in this case naphtha was used as the solvent, the solution mopped up, and the surface washed with soap and water. After a frequent repetition of this process, the surface seemed clear of impurities, and though not so bright as I had frequently seen it in Mr. Grubb's workshop, there were no signs of mealiness, the only unpleasant casualty being a considerable pitting of two patches some two inches square, produced by droppings from the muriate used in soldering the tin cover. These pittings are deep and unsightly; but the extent of surface corroded is comparatively so small that the effect must be inconsiderable.

The specula were exchanged about two months ago, and A put on the machine; but nothing has yet been done towards repolishing, as the necessary arrangements have not been got together for performing that delicate operation with due convenience.

Of work done, I cannot yet speak with any satisfaction since it became at all practicable to use the telescope; the history which I have to relate is

a long chapter of weary heart-breaking watchings, with an occasional half hour's work.

η Argo was the first object observed for purpose of delineation; after the first night's work little (and that by snatches) was done towards it, a new inroad of workmen and a long course of extremely unfavourable weather having carried the nebula out of convenient reach. The search, which was reluctantly given up, will, however, be again soon resumed.

I enclose two sketches, 4403 and 3570, of the 1864 catalogue.

4403. The horseshoe nebula is a grand object, conspicuous and with shape even in the finder (Plate I.). In the sketch the principal stars are laid down from measured position-angles about different centres; they are not as accurate as I could wish, and will be reobserved differently under better conditions; in no case, however, can there be sufficient error to influence in any material degree the configurations of the nebula or the smaller stars sketched in by eye.

It will be seen that the sketch contains considerably more detail than the corresponding figure in Herschel's Catalogue; there appears, however, to be no marked difference (with perhaps one exception) which may not be accounted for by the difference of aperture used.

The exception to which I allude is the presence of a small but conspicuous double star at the s. p. angle of the knot which lies between the $\mathcal{V}$ and the bright streak; the experiment has not been tried of cutting down the aperture to approximate to an 18-inch Herschelian, but the intrinsic brightness of the principal star, and the presence in the C. G. H. of stars not more bright (No. 3 of Herschel's catalogue is certainly less bright) go far to show, without this experiment, that the star did not exist as such with its present brilliancy at the time of the C. G. H. and P. T. 33 observations . . . I have not seen Mr. Mason's drawing, but look forward with much interest to examining it and his remarks thereon.

The important position of the star, and the careful scrutiny which the knot and its neighbourhood must have repeatedly undergone, forbid the assumption that it was simply overlooked by Sir John Herschel.

The star β (I keep to Sir John Herschel's numbers and letters) is conspicuously and beautifully double, the companion of considerable brilliancy, about 15 mag.; with its present brilliancy and elongation it should, I think, be within reach of an 18-inch.

The knot is what I presume should be called resolvable; the appearance is sparkling, though no discrete stars can be seen, except perhaps a second faint one, which is suspected at the s. f. angle. Part of the streak near to the knot is also sparkling, but not in so marked a manner; the other portions appear of the ordinary milky nebulosity.

The fainter nebulosity (S) of the bright streak pretty well marks out the borders of the almost vacuous lane which leads up to and past the knot. On receding from the lane it becomes very faint: nor is this faintness uniform; but the appearances are so fugitive that, after repeated and painful

effort, I have been unable to catch them; the borders, however, stretching to the stars, as in the figure, are occasionally pretty well seen. On one or two occasions I have suspected the existence of a link between the nebulosity about the star No. 10 and the lower portion of the ♂; this, however, requires verification.

At the f. end the upper and smaller semicircle is plainly marked, the lower and larger very faint, and consequently its exact figure uncertain; there is certainly some very faint nebulosity leading through the groups of stars north of the three bright f. end stars, but it has not been added to the sketch on account of its uncertain figure and extreme faintness.

3570. A small but beautiful spiral. The two brighter knots are resolvable; the greater brightness of these knots is not particularly shown in Sir John Herschel's sketch (Plate I.), but is mentioned in the observations; the general ground is only slightly nebulous.

Of work out of the regular course, amongst other things, Neptune has been observed on some five or six occasions for figure and a second satellite, with only negative results.

In the absence of a photographic apparatus to be used at the uninterrupted focus of large mirror, attempts have been made to utilize the 2nd or Cassegrain image; an average exposure of near ten minutes on an eight-day moon produced pictures which (by no means good) were of sufficient promise to make it worth while to resume the attempt under more favourable conditions.

The time of exposure is somewhat surprising, and would seem to accuse a great loss of chemical rays by a second perpendicular reflexion; but perhaps the more legitimate conclusion would be that the inactivity was mainly due to absorption at the surface of the large mirror, which was then very yellow.

The spectroscope arrived some time ago, but has not been much used; it is thought that for *star* work of any value some modification will be required, principally the exchange of the present collimator for one of longer focal length. A greater dispersion, moreover, seems desirable; for nebular work, however, for which it was mainly designed, the spectroscope in its present form, which is handy and compact, will be of much service.

For spectroscopic work on objects having a sensible diameter, the great telescope itself labours under some disadvantages; the enormous focal length and consequent magnification of the image is a serious inconvenience in the case of faint objects, and may be only partially remedied by a suitable condenser. This magnifying of the image may, however, in some cases be advantageous: I allude to the possibility thereby afforded of viewing small definite portions of moderately bright objects; unfortunately the objects with which we have to deal are seldom of such a character.

Of nebulæ, Orion has been examined for purpose of practice. The three lines are plainly and conspicuously seen; the hydrogen line is comparatively much fainter than I had anticipated, and disappears in the fainter

portions of the nebula. 30 Dorado shows the nitrogen line with facility; the second line certainly, but not in all positions, and always with difficulty; the hydrogen line is suspected only. I can see no trace of a continuous spectrum.

η Argo has been observed on only one unfavourable morning; the nitrogen line was seen over a considerable space; of the presence or absence of others, or of a continuous spectrum, I am unable to speak with certainty.

With respect to future operations, it is intended that at first the routine work shall consist of a detailed delineation of the objects figured by Sir John Herschel, or any others which may prove interesting: this will take some time; for even without the impediment of cloudy weather, the delineation, with any degree of satisfactory correctness, of a moderately large nebula requires a considerable amount of work and careful and frequent scrutiny. It is hoped, however, that this work will by practice be found less painfully difficult than it is at present.

The spectroscope will be used as much as possible, the moon photographed, and attempts made to photograph the nebulæ, when a photographic apparatus has been procured, and staging, photographic room, &c. added to the building. It is, moreover, hoped that before long a refractor, of some nine inches aperture, may be procured, to be mounted with the reflector, or, preferably, as a separate instrument.

This telescope, besides being of much general use, will find much and valuable employment in determining micrometrically the chief points in the nebulæ under examination with the reflector, with more expedition and accuracy than at present; for spectroscopic work this telescope would be a valuable adjunct, especially if it be constructed of such comparatively short focal length as seems now to be practicable.

The great interest which the Royal Society has taken in everything connected with the Melbourne reflector is my sole apology for sending thus early such a meagre account.

February 24, 1870.

Lieut.-General Sir EDWARD SABINE, K.C.B., President, in the Chair.

The following communications were read:—

I. "Note on certain Lichens." By JOHN STENHOUSE, LL.D., F.R.S., &c. Received January 10, 1870.

Through the kindness of W. Carruthers, Esq., of the Botanical Department of the British Museum, I obtained a considerable quantity of lichens from the neighbourhood of Moffat in Scotland. These were *Cladonia rangiferina*, and a mixture of *Usnea barbata* and *Evernia prunastri*,